CLAIMS

1. A fluid heating device comprising:

a case member; and

a heating element accommodated in the said case member,

a flow path being formed between an outer surface of said heating element and an inner surface of said case member, and further comprising

a turbulent flow generation mechanism that generates turbulent flow in at least a part of said flow path.

2. The fluid heating device according to claim 1, wherein

said turbulent flow generation mechanism is provided in a portion where the speed of a fluid circulated in said flow path is reduced.

3. The fluid heating device according to claim 1, wherein

said turbulent flow generation mechanism is provided on the downstream side of said flow path.

4. The fluid heating device according to claim 1, wherein

said turbulent flow generation mechanism is intermittently provided in said flow path.

5. The fluid heating device according to claim 1, wherein

said turbulent flow generation mechanism is provided on the upstream side of said flow path.

6. The fluid heating device according to claim 1, wherein

said heating element has a stick shape having a circular or elliptical cross section.

7. The fluid heating device according to claim 6, wherein said turbulent flow generation mechanism comprises a spiral member wound around an outer peripheral surface of said heating element.

8. The fluid heating device according to claim 7, wherein said spiral member is composed of a spiral spring.

9. The fluid heating device according to claim 7, wherein

said case member has a cylindrical fluid inlet and a cylindrical fluid outlet that are provided parallel to the direction in which said spiral member is wound.

10. The fluid heating device according to claim 6, wherein

said case member has a fluid inlet and a fluid outlet, and

at least one of said fluid inlet and said fluid outlet is provided at a position eccentric from the center axis of said heating element such that a fluid flows in in a direction along the outer peripheral surface of said heating element or flows out in the direction along the outer peripheral surface of said heating element.

11. The fluid heating device according to claim 1, wherein

said heating element has a maximum calorific value of not less than approximately 1.5 kW nor more than approximately 2.5 kW.

12. The fluid heating device according to claim 1, wherein

said heating element has such a performance that the maximum gradient of the temperature rise speed of a fluid is not less than approximately 10 K per second.

13. The fluid heating device according to claim 1, wherein said heating element comprises a sheathed heater.

14. The fluid heating device according to claim 13, wherein said sheathed heater has a maximum watt density of not less than approximately 30 W/cm^2 nor more than 50 W/cm^2.

15. The fluid heating device according to claim 1, wherein said heating element comprises a ceramic heater.

16. The fluid heating device according to claim 1, further comprising

a temperature detector that detects the temperature of said heating element, and

a control device that controls the supply of power to said heating element on the basis of the temperature detected by said temperature detector.

17. The fluid heating device according to claim 16, further comprising

a heat sensitive plate having a portion provided so as to come into contact with said heating element and projecting toward the outside of said case member,

said temperature detector being provided outside said case member and detecting the temperature of said heating element through said heat sensitive plate.

18. The fluid heating device according to claim 17, wherein

said heating element has a heating portion and a non-heating portion, and

said heat sensitive plate is provided so as to come into contact with the non-heating portion in said heating element.

19. The fluid heating device according to claim 17, wherein

said case member has said fluid inlet and said fluid outlet, and

said heat sensitive plate is provided so as to come into contact with said heating element in the vicinity of the fluid outlet of said case member.

20. The fluid heating device according to claim 17, wherein said heat sensitive plate is joined to said heating element.

21. The fluid heating device according to claim 17, wherein said heat sensitive plate is brazed to said heating element.

22. The fluid heating device according to claim 17, wherein said heat sensitive plate has a leakage preventing function for preventing leakage of a fluid within said case member.

23. The fluid heating device according to claim 17, wherein said heat sensitive plate is composed of a metal.

24. The fluid heating device according to claim 17, wherein said heat sensitive plate is composed of a copper plate.

25. The fluid heating device according to claim 17, wherein said heat sensitive plate is formed in a substantially L shape.

26. The fluid heating device according to claim 1, further comprising

a heat transfer member having a portion provided so as to come into contact with the fluid in said flow path and projecting toward the outside of said case member, and

a heat generating electronic component provided in a portion of said heat transfer member projecting toward the outside of said case member for supplying power to said heating element.

27. The fluid heating device according to claim 26, wherein

said case member has said fluid inlet and said fluid outlet, and

said heat transfer member is provided so as to come into contact with said fluid in the vicinity of the fluid inlet of said case member.

28. The fluid heating device according to claim 26, wherein said heat transfer member has a leakage preventing function for preventing leakage of a fluid within said case member.

29. The fluid heating device according to claim 26, wherein said heat transfer member is composed of a metal.

30. The fluid heating device according to claim 26, wherein said heat transfer member is composed of a copper plate.

31. The fluid heating device according to claim 26, wherein said heat transfer member is formed in a substantially L shape.

32. The fluid heating device according to claim 1, wherein

said case member comprises a plurality of case member parts,

said heating element comprises a plurality of heating element parts respectively accommodated in said plurality of case member parts,

a flow path is formed between an inner surface of each of the case member parts and an outer surface of each of the heating element parts, and

said turbulent flow generation mechanism further comprises a plurality of turbulent flow generation mechanism parts for generating turbulent flow in at least a part of each of said plurality of flow paths.

33. The fluid heating device according to claim 32, wherein

each of the plurality of case member parts has a fluid inlet and a fluid outlet, and

the fluid outlet of one of the case member parts is formed such that it can be fitted in the fluid inlet of the other case member part.

34. The fluid heating device according to claim 32, wherein

each of the plurality of case member parts has a fluid inlet and a fluid outlet, and further comprising

a connection member for connecting the fluid outlet of one of said case member parts and the fluid inlet of said other case member part.

35. The fluid heating device according to claim 32, wherein said plurality of case member parts have the same shape.

36. A washing apparatus that sprays a fluid supplied from a water supply source to a portion to be washed of the human body, comprising:

a fluid heating device that heats the fluid supplied from said water supply source while causing the fluid to flow; and

a spray device that sprays the fluid heated by said fluid heating device to said human body,

said fluid heating device comprising

a case member, and

a heating element accommodated in said case member,

a flow path being formed between an outer surface of said heating element and an inner surface of said case member, and further comprising

a turbulent flow generation mechanism that generates turbulent flow in at least a part of said flow path.

37. A washing apparatus that washes clothes using a fluid supplied from a water supply source, comprising:

a washing tub;

a fluid heating device that heats the fluid supplied from said water supply source while causing the fluid to flow; and

a supply device that supplies to the washing tub the fluid heated by said fluid heating device,

said fluid heating device comprising

a case member, and

a heating element accommodated in said case member,

a flow path being formed between an outer surface of said heating element and an inner surface of said case member, and further comprising

a turbulent flow generation mechanism that generates turbulent flow in at least a part of said flow path.